Appeal to the Board of Environmental Protection In The Matter Of:
Spruce Mountain Wind LLC [L-24838-24-A-N // L-24838-2G-B-N]

- Appeal and Request for Public Hearing (dated November 3, 2010)
  Friends of Spruce Mountain and Other Aggrieved Parties

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RUFUS E. BROWN
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November 3, 2010

Via E-Mail and U.S. Mail

Susan Lessard, Chair
Board of Environmental Protection
c/o Terry Dawson
17 State House Station
Augusta, Me. 04333

Re: *Appeal of Final Order in the Spruce Mountain Wind Project L-24838-24-A-N & L-24838-2G-B-N by Friends of Spruce Mountain and Other Aggrieved Parties*

Dear Ms. Lessard:

I am e-mailing the Appeal of the Friends of Spruce Mountain and Other Aggrieved Parties from the final Order of the DEP in the Spruce Mountain Wind Project matter referenced above. A hard copy of the appeal will be sent by mail today.

Sincerely yours,

Rufus E. Brown

REB/encl.

Beth Nagusky, Acting Commissioner, via e-mail and U.S. Mail
Juliet Brown, Esq., via e-mail and U.S. Mail
Friends of Spruce Mountain via e-mail

STATE OF MAINE
BOARD OF ENVIRONMENTAL PROTECTION

In Re:

SPRUCE MOUNTAIN WIND LLC Woodstock, Oxford County SPRUCE MOUNTAIN WIND PROJECT L-24838-24-A-N L-24838-2G-B-N (approval)	)))))	**APPEAL OF DEPARTMENT ORDER BY FRIENDS OF SPRUCE MOUNTAIN AND OTHER AGGRIEVED PARTIES**

Pursuant to 38 M.R.S.A. Sections 344.2-A and 341-D.4 and 06-096 CMR ch. 2 (the "DEP Procedural Rules") Section 24.B(1), the Friends of Spruce Mountain ("FOSM"), Scot and Thelma Kendall, Leo Bilodeau and Irene Chabot, Nathaniel Snow, Richard and Patricia Mabey, Richard Marasse, Robert and Joann Moulton, Daryle Routhier, Nate Ladd and Rob Roy, Kevin Corbett, Wendall Hall and Richard and Suzee Woods (the "Aggrieved Parties") appeal to the Board of Environmental Protection (the "BEP") from the Order of the Department of Environmental Protection (the "DEP") dated October 5, 2010, approving the application of Spruce Mountain Wind LLC (the "Applicant") for the Spruce Mountain Wind Project (the "Project"). The Aggrieved Parties request a public hearing on its appeal on the grounds that there is credible conflicting technical information regarding the licensing criterion and it is likely that a public hearing will assist the BEP in understanding the evidence. Section 7.B of the DEP Procedural Rules.

AGGRIEVED PARTY STATUS

Appellant FOSM is a nonprofit entity organized for the purpose of protecting Spruce Mountain in Woodstock, Maine from adverse environmental impacts from the grid scale wind project proposed by Spruce Mountain Wind, including the exposure of its members from excessive noise. In particular, FOSM was formed to participate in the DEP application process, and is aggrieved by the DEP Order on the Spruce Mountain Wind Project for the following

reasons: Woodstock and neighboring towns are places where members of FOSM have invested substantial amounts of money and spent substantial amounts of time in order to take advantage of the remarkable environment that includes the lakes and the spectacular natural setting that it occupies. The members of FOSM are aggrieved because the environment of Woodstock and neighboring towns at night becomes very quiet. The presence of turbine noise which rises above the background nighttime noise level will destroy the soundscape that provides an important part of the experience of living in the area. The presence of 11 wind turbines will detract from the natural experience upon which the members' enjoyment of their properties relies. The members of FOSM have concluded that noise from the project will exceed Maine's noise limits at night due to the coherent effects of 11 turbines operating synchronously sited close to nearby residences, which experiences very quiet rural nighttime ambient noise levels due to stable atmospheric conditions, which further compounds the noise by making it stand out above background levels. FOSM is concerned that the Applicant has failed to use generally accepted acoustical engineering principles in their prediction model and has significantly under-predicted the noise emitted by these turbines. Members of FOSM believe the Applicant has ignored widespread evidence of the potential for sleep disturbance and other health effects from the low frequency noise emitted by these enormous machines. A frequent activity of many of the members is hiking and boating and fishing while enjoying the mountain scenery that surrounds the lakes and to observe local wildlife. The presence of 11 turbines will alter the natural setting and be a constant visual distraction due to the constant motion of the enormous spinning blades. The members of FOSM are aggrieved because Woodstock has historically been an area rich with

wildlife, as evidenced by its rating of statewide significance for wildlife in the Maine's Finest Lakes Survey. The protection of wildlife is a great concern to the members. The presence of turbines presents many known risks to wildlife including eagles, raptors, bats, and migrating bird flocks. Members of FOSM have concluded that the Spruce Mountain Wind Project will have an undue adverse impact on their right to the enjoyment of life by virtue of its close proximity to their properties and to the waters of Woodstock and that the Project will constitute a public nuisance. Members of FOSM believe that the DEP has failed in its duty to require the Applicant arrange for secured funding for the cost of a decommissioning plan for the Project.

Appellant Kevin Corbett is a part time resident of 57 Saunders Road in Woodstock, Maine, 3500 feet from the nearest proposed turbine of the Project. He is a member of FOSM and is aggrieved in the manner as described above for FOSM. In addition, he sits out on his deck at night and listens to the silence, especially at this time of year when there is no summer activity. He fears that this experience will be gone forever. He saved all his life to buy his land and build his house on it, only to find that the Applicant was planning to build an industrial wind farm virtually right over his head. He never would have bought the property if he had known. He had planned to retire to Woodstock, but if the Project is built, he will probably leave the area as soon as he can.

Appellant Richard Marasse is a part time resident of 8 Saunders Road in Woodstock, Maine. He is a member of FOSM and is aggrieved in the manner as described above for FOSM. His residence is not listed as a receptor, but the nearest turbine will be approximately 3300 ft. from his house. He will be aggrieved because of the constant noise from the Project, constant

light (especially at night), and alteration of the water flow into the brook which serves his property.

Appellant Nathaniel Snow is a part time resident of Lot # 18, Eagles Nest, Woodstock, Maine. His residence is not listed as a receptor, but the nearest turbine will be approximately 2600 ft. away from his residence. He is a member of FOSM and is aggrieved in the manner as described above for FOSM. He also is aggrieved because the turbines will be sited less than 1/2 mile from his residence, which is too close for a scenic and tranquil site like his residence. The noise modeling is inadequate. The noise impact will be over the legal standard and will completely change the character of this area. Residents will become responsible for the monitoring of this Project with receptors on their properties and calling a hotline every time noise levels are exceeded; the only way to ensure noise standards are met is to ensure a more adequate buffer around any proposed turbine. The bird study in this proposal was inadequate. There is voluminous avian activity in this area and this will be very negatively impacted. He bought his property because it was remote and extremely quiet and (ironically, perhaps) off-the-grid. The scenic impact study ignored complete user groups, and was poorly designed and implemented. The Project will have a negative impact on hikers, bird watchers, snowshoers, rock climbers, fishermen, canoeists and people will simply choose to go elsewhere than enjoy the bountiful public lands that surround this Project. The loss in property tax revenue alone will outstrip the $20,000 annual payment to the town. Three lots are already for sale in Eagle's Nest and the rest will follow leaving this a wasteland, nobody will build camps, excavate driveways, or drill wells. People won't come.

Appellants Leo Bilodeau and Irene Chabot are full time residents of Woodstock, Maine. They own Receptor Sites No 12 identified in the sound level study of Terra Tech and listed in the DEP Order under review. They are members of FOSM and are aggrieved in the manner as described above for FOSM.

Appellant Wendall Hall is a part time resident at 38 Pelletier Rd Bryant Pond Maine. His house is approximately 7200 ft. away from the closest turbine. He is a member of FOSM and is aggrieved in the manner as described above for FOSM. In addition, he is aggrieved because he is concerned about the environmental impacts from the roads that will be built. There will be major damages to the surrounding area from the run off. This is a wetland area with many ponds and streams. He has concerns about the negative effect of the Project on wildlife. There have been many studies showing that sounds travels much farther over water. There is direct line of sight from his property to the turbines over Concord Pond with nothing to stop the sound. He is worried about the impact of the Project on his property value.

Appellants Scot and Thelma Kendall are full time residents at 1105 Redding Road, Sumner, Maine. They own Receptor Sites Nos. 14 and 21 identified in the sound level study of Terra Tech and listed in the DEP Order under review. They are members of FOSM and are aggrieved in the manner as described above for FOSM.

Appellants Richard and Patricia Mabey are part time residents of 17 Pine Tree Lane, Bryant Pond Maine on Concord Pond. They object to the Project in the manner described for FOSM. Also they object because they purchased their properties several years ago because of the peace and beauty of the area. It is also a place where they have spent time with family since the

1950's. It is an area rich in wildlife, scenic beauty and reflects our interests in nature, kayaking and hiking. Currently there is no noise or light pollution in this pristine area. They are concerned about the adverse health effects from the Project, the adverse impact on the area's scenic beauty, adverse effects on the environment, the adverse effect on property values, inadequate funding of a decommissioning plan and a long term negative impact on local jobs.

Appellants Robert and Joann Moulton part time residents of 46 Pelletier Lane, Bryant Pond, Maine. They object to the Project in the manner described for FOSM and also for the reasons described above by Appellants Richard and Patricia Mabey.

Appellant Daryl Routhier is a part time resident at Lot #13 Eagles Nest, Saunders Road, in Woodstock, Maine. He owns Receptor Site No.10 identified in the sound level study of Terra Tech and listed in the DEP Order under review. The Spruce Mountain Wind Project turbines will be in very close proximity to his property. He is a member of FOSM and is aggrieved in the manner as described above for FOSM. He purchased his property five years ago as a getaway destination because of its beautiful scenery and peaceful setting. He is an avid hunter, fisherman, hiker, and ATV enthusiast. He would not have purchased the property had he known turbines would be in close vicinity. He thinks the Project will have a negative effect on his property value. He is also worried about a disturbance in the wildlife patterns that will directly affect his hunting.

Appellants Nate Ladd and Rob Roy are part time residents at Lot #16 Eagles Nest, Bryant Pond Maine 04219. There are no receptors on the property, but the nearest turbine will be only 2500 -3000 ft. away. They are members of FOSM and are aggrieved in the manner as described

above for FOSM. They object to the Project because of its proximity to their property. Noise from the turbines that will make living on the property unhealthy and unappealing. They are concerned about the loss of property value and hence our investment in the property and the impact on wildlife in the area; the impact on the watershed of Spruce Mountain.

Appellants Richard and Suzee Woods are part time residents at 62 Pelletier Lane, Bryant Pond, Maine. They own a house just over a mile from the Project. They object to the economics of the Project and the absence of adequate funding of the decommissioning plan.

FINDINGS AND CONCLUSIONS OBJECTED TO

The Aggrieved Parties object to the DEP Order's Findings and Conclusions on Noise (Section 5), DEP Order at 6-16, Decommissioning (Section 24), DEP Order at 51-53 and Visual Impact (Section 6), DEP Order at 16-25. The Aggrieved Parties also appeal the findings and conclusions related to these subjects.

BASIS FOR THE APPEAL- OBJECTION TO NOISE

The Applicant's noise consultant, Tetra Tech, developed a sound level model for the Project that predicted that the Project would comply with nighttime quiet area Sound Level Limits of the DEP's Noise Rule, Chapter 375 §10.C.1.v, of 45 dBA only by operating 6 turbines in Noise Reduction Operating mode ("NRO") in accordance with the requirements of DEP's consultant, Enrad Consulting. The resulting sound level predictions in relation to 22 residential receiver points is set forth in the DEP Order at 10, showing a cushion of a low of 0 dBA for Receiver Point No. 12 to a cushion of just 8 dBA for other Receiver Points. With the modeling changes and NRO mode operations specified by Enrad, the DEP Order found that the Project

would comply with the DEP Noise Rule.

The Aggrieved Parties object to the approval of a wind project with such a slim margin for error in modeling. The recent experience of the undersigned, as well as the expert consultant of the Aggrieved Parties, Richard James, is that in the real world NRO operating mode will not work as predicted. In Vinalhaven, only one turbine was required to operate in NRO as a condition of licensing, but once the turbines began operating, nearby residents experienced excessive noise. *See Aggrieved Parties Exhibit 3,* the Report of Richard James dated September 30, 2010 at 7-8 and the Exhibits Related to Vinalhaven, *Exhibit 30* (The applicant's sound assessment) and *Exhibit 31* (DEP email reporting preliminary findings of noncompliance.). Given the other uncertainties in modeling addressed below, the lesson we have learned so far is that if a wind project cannot be predicted to be in compliance with the nighttime sound level limits with operating in NRO it should not be approved.

I. THE DEP SHOULD NOT HAVE ACCEPTED THE PREDICTION MODELING. FOR THIS PROJECT.

The Aggrieved Parties raised several flaws in the prediction modeling performed by Tetra Tech in its sound level assessment described below. The errors in the modeling, which should have caused DEP to reject the Application for the Project, are the following:

A. The Limitations of the Models Used to Measure Noise.

The DEP Order explains that prediction modeling software used by Tetra Tech for its sound level assessment was the Cadna/A operating in ISO 9613-2, *Attenuation of Sound During Propagation Outdoor,* mode. DEP Order at 7. This prediction modeling software is not designed for wind turbines and it is not designed for sound sources at a height of a ridgeline,

such as that proposed for the Project. Report of Richard James, *Aggrieved Parties Exhibit 3*, *supra*, at 1-2.

The problems with using Cadna/A (operating in ISO 9613-2) were acknowledged by the DEP's own consultant, Warren Brown of EnRad Consulting, in an internal conference call in March 2009 on the subject of noise in wind power applications pending before the DEP. In the *Notes of March 5, 2009 DEP Conference Call* between Warren Brown, Dora Mills, Maine Center for Disease Control ("MCDC"), and others (*Aggrieved Parties Exhibit 4*), Warren Brown stated that he "has issues with [the] model being used. Currently it's based on industrial noise, not wind power noise. ***We haven't been able to determine whether this model is accurate for wind turbines.***" [Emphasis added.] Later in the Notes he states that RSE predicts compliance with 45 dBA nighttime noise, "but [he] still [has] questions regarding the model – [it is] based on industrial noise." He states "wind turbine noise needs more investigation. 1. Need to be able to predict stable atmospheric conditions .... 2. Set up protocol for acoustic measurements with DEP staff member on site. ... Questions RSE's assumption – due to model. ... There is a period when turbines are loud. ***Not sure how to predict this yet. Need to figure out stable atmospheric conditions.***" [Emphasis added.]

The concerns expressed by Warren Brown in the conference call are reflected in credible scientific literature on the subject. For example, Frank H. Brittain & Marlund E. Hale, in their article, "Some Limitations of Ray-Tracing Software for Predicting Community Noise from Industrial Facilities," NOISE-CON, Dearborn, Michigan (July 28-30, 2008) (*Aggrieved Parties Exhibit 9)*, state that ISO 9613 estimates the accuracy of A-weighted sound propagation noise for

distances only up to 1 km, but it is routinely used for distances greater than that.

In addition to these core problems with the use of Cadna/A, the Aggrieved Parties' expert, Richard James, also points out that Tetra Tech used a ground absorption value of **.5**, which assumes that the ground will absorb half of the energy it comes in contact with, whereas the proper setting for ISO-9613-2 should be **0.** This error alone, according to Richard James, under-predicts the sound levels by a minimum of 2 dBA. Richard James Report, *supra* at 2.

B. The Failure to Factor in Atmospheric Stability.

The prediction modeling of Tetra Tech, accepted by the DEP Order, is also flawed because it does not take into effect "atmospheric stability." The effect of "atmospheric stability" on the accuracy of sound assessments using the ISO 9613 algorithms that Warren Brown referred to in the DEP meeting is the focus of a study by Clifford Schneider, "Accuracy of Model Predictions and the Effects of Atmospheric Stability on Wind Turbine Noise at Maple Ridge Wind Power Facility, Lowville, NY- 2007," *Aggrieved Parties Exhibit 14.* Atmospheric stability occurs at night when the land cools and vertical air movement disappears, and where wind can be calm on the ground but continue to blow at hub-height. When this occurs, Schneider explains, "[w]ind turbine sounds are more noticeable, since there is little masking of background noise, and more importantly, because atmospheric stability can amplify noise levels significantly." *Id* at 6. Schneider states that most wind assessments never mention atmospheric stability. *Id.* at 7. The flaws in wind turbine predictions that do not take into account of atmospheric stability has been recognized at least since 2003, in the peer reviewed study of G.P. van den Berg, "Effects of Wind Profile at Night on Wind Turbine Noise," *Aggrieved Parties Exhibit 10.*

Richard James points to Tetra Tech's failure to take into account atmospheric stability as a serious flaw in its predictions. Report of Richard James, *Exhibit 3*, *supra* at 4-5. Based on his experience, he attributes this phenomenon as a significant reason why the wind turbines in Vinalhaven are exceeding the sound levels predicted. *Id. See also,* R Kochanow & N. Mackenzie, "Atmospheric Stability Specific Noise Criteria and Noise Predictions for Wind Farms," Acoustics 2008, *Aggrieved Parties Exhibit 13.*

C. The Failure to Use Line Source Calculations.

The Tetra Tech sound level assessment for the Project modeled wind turbine sound powers emissions "as an idealized point source in place of a distributed area source." DEP Order at 7; Tetra Tech's January 2010 sound level assessment at 5-11-12. The DEP should have required modeling predictions using "line source" calculations. Line source calculations measure sound propagation perpendicular to a row (line) of wind turbines, giving effect to the combined noise from the line that radiates in a cylindrical (directed) manner as opposed to a spherical (like a ripple in a pond) manner. The decay rate of a line source is *3 dB* for every doubling of distance, one half of the decay rate of a point source of *6 dBA* per doubling. Richard James Report, *Exhibit 3, supra*, at 3. There is clear scientific consensus on this issue. *See also*, NASA, Hubbard & Shepherd, "Applied Acoustics Handbook," *Aggrieved Parties Exhibit 7* at 27 and C.E. Ebbing, "Applied Acoustics Handbook," *Aggrieved Parties Exhibit 6,* at 2-8 through 2-10. The NASA study, *Exhibit 7, supra,* at 27 explains that the line source and point source produce similar results only at distances that exceed the length of the line. Tetra Tech asserts in its original sound assessment, *supra* at 12, that its use of ISO 9613-2 includes a calculation of both line source and

point source. Richard James states that this is not correct. A review of ISO 9613-2 shows that there are no provisions for cylindrical spreading in the standard." *Exhibit 3, supra,* at 3. If line source calculations were used, the DEP nighttime noise limits of 45 dBA would be exceeded for protected locations in this case. *Id.*

D. The Failure to Apply the 5 dBA Penalty for SDRS.

Tetra Tech did not include the effects of Short Term Duration Repetitive Sounds ("SDRS") in its modeling of the Project. The DEP Noise Rule, Section 10.D. 19, defines SDRS as a "sequence of repetitive sounds which occur more than once within an hour, each clearly discernible as an event and causing an increase in the sound level of at least 6 dBA on the fast meter response above the sound level observed immediately before and after the event, each typically less than 10 seconds in duration, and which are inherent to the process or operation of the development and are foreseeable." Section 10.C.1 (e) (i) imposes a 5 dBA penalty when SDRS is present for purposes of measuring sound level limits. If SDRS had been included in the model predictions, the Project would not comply with the nighttime Sound Level Limits of the DEP Noise Rule.

The DEP Order states that it was not necessary for the Applicant to model for SDRS based on two studies from the UK, one 14 years old, ETU Report for the United Kingdom Department for Trade and Industry, "The Assessment and Rating of Noise from Wind Farms," (1996) and University of Salford, "Research into Aerodynamic Modulation of Wind Turbine Noise: Final Report" (2007), and a memorandum of Kenneth Kaliski of RSG opining that SDRS is not expected to be a "common occurrence" at the Project and a similar opinion by Enrad that

SDRS is not expected to occur "on a regular basis" at the Project.

Richard James concludes that it was an "egregious error" to ignore SDRS in the modeling of sound for this project. *Exhibit 3, supra* at 6. He explains that "SDRS of 5-6 dBA is common for wind turbines (with SDRS of 10 to 15 dBA or more observed as a less frequent maximum), especially during periods of turbulence due to weather fronts or topography and during temperature inversions where the wind shear does not follow a simple gradient from ground to heights above the upper reach of the turbine blades, and that these conditions have been documented and reported in research papers by Hubbard and Shepherd in the 1990's ("Wind Turbine Acoustics", *Exhibit 7, supra*) and more recently by Dr. Van den Berg. He opines that it cannot be assumed that the Spruce Mountain Project wind turbines will not exhibit SDRS. Blade swish and thump, also referred to as amplitude modulation, is discussed in papers at annual conferences all around the world. If this is a condition that [were] infrequent or limited to a few makes and models of wind turbines why are there so many research papers published investigating it? " *Id.* at 5-6. He further explains that the two UK studies referred to be under serious challenge by acoustical experts in the UK and that it was discovered that the Salford University study misrepresented the findings of the studies it used. *Id.*at 5. *See also*, Dr. Christopher Hanning, "Wind Turbine Noise, Sleep and Health, April 2010)", *Aggrieved Parties Exhibit 28,* at §3.6. Finally, Richard James points out that the 5 dBA penalty does not have to occur on a "regular basis" or "commonly" to be applied under the DEP Noise Rules.

E. Conclusion about the Applicant's Predictive Measurements

Given the limitations and flaws in the modeling of this Project, coupled with the

necessity of requiring 6 turbines to operate in NRO mode to meet the DEP Noise Rule Sound Level Limits, the Department should not have accepted and approved Tetra Tech's sound predictions as showing compliance of the Project with the Noise Rule. If allowances were made by the DEP for the limitations and flaws of the sound propagation models the nighttime noise limits specified by DEP Noise Rule would be exceeded for the Spruce Mountain Project. The Board should head the lessons from Mars Hill, Liberty and Vinalhaven that projects sited so close to residences in the real world conditions result in serious noise complaints from routine operations. A greater cushion should be required to protect the local population. The fact that 6 turbines have to operate in NRO, never before required by the DEP, should be a clear warning that excessive noise will be generated at this location. Until the Department has more experience with the efficacy of wind projects operating in NRO, which to date has been limited and, in the case of Vinalhaven unsuccessful, a project like this should not be permitted based on this issue alone.

II. THE DEP ORDER FAILS TO PROTECT AGAINST THE ADVERSE HEALTH EFFECTS OF NIGHT TIME NOISE AT THE PROJECT.

The DEP Order states that the Applicant through its predictive modeling as modified by the requirements of Enrad Consulting will meet the applicable Sound Level Limits of the DEP Noise Rule and that no other action is required to protect residents of the Town of Woodstock against the adverse health risks from noise expected to be generated by the Project. DEP Order at 13 and 16. The Aggrieved Parties challenge these findings. Dr. Eja Pederson, the world renowned Swedish expert on the subject of wind turbine noise recently warned that "the public concern regarding the possible health risks among people living in the vicinity of wind turbines

should be treated seriously." E. Pederson, "Effects of Wind Turbine Noise on Humans," Third International Meeting on Wind Turbine Noise, June 17-19, 2009, *Aggrieved Parties Exhibit 21*, at 2. The Aggrieved Parties ask this Board to do that.

A. Noise from the Project will Create Adverse Health Effects.

Dr. Michael Nissenbaum, who is an expert in the medical effects of exposure to excessive wind turbine noise, after reviewing the materials in the Spruce Mountain Project on noise, and based on his studies of other wind projects, has concluded that residents of Woodstock will suffer adverse effects from the Project. Affidavit of Michael Nissenbaum, *Aggrieved Parties Exhibit 1,* at ¶s 3, 7 and 8. He opines that "the turbines proposed for the Spruce Mountain Wind Project will be located too close to residents in the proximity of the project. Of the 22 receptor sites, all will be within 2000 meters of a wind turbine and 9 will be within 1100 meters of a turbine. I further note that the turbines proposed for Spruce Mountain Wind Project are 2.0 MW, larger than those installed in Mars Hill and Vinalhaven. Based on this information, I would expect that the residents at a minimum of 9 receptor sites will experience the same or similar adverse health effects, including and especially sleep disturbance, in the same proportions as the affected residents living within 1100 meters (3500ft) of the turbine installation at Mars Hill, and that other receptor sites will be exposed to an unknown risk of adverse health effects.." *Id.* The health effects he anticipates are:

a) Sleep disturbances/sleep deprivation and the multiple illnesses that cascade from chronic sleep disturbance. These include cardiovascular diseases mediated by chronically increased levels of stress hormones, weight changes, and metabolic disturbances, including the continuum of impaired glucose tolerance up to diabetes;

b) Psychological stresses which can result in additional effects including cardiovascular disease, chronic depression, anger, and other psychiatric symptomatology;

c) Increased headaches;

d) Unintentional adverse changes in weight;

e) Auditory and vestibular system disturbances; and

f) Increased requirement for and use of prescription medication.

Id. at ¶5. *See also,* Affidavit of Albert Aniel, M.D., *Aggrieved Parties Exhibit 2*, at ¶6 ("I firmly believe that placing industrial wind turbines according to the planned project will most certainly cause mental and subsequent adverse health effects to people living within a mile of such project.").

Dr. Nina Pierpont in her book published in 2009, *Wind Turbine Syndrome*, *Aggrieved Parties Exhibit 23,* at 26 "documents a consistent and often debilitating complex of symptoms experienced by adults and children living near [1000 to 4900 feet] large industrial wind turbines (1.5 – 3 MW)," such as the proposed Spruce Mountain Wind Project. The symptoms found by Dr. Pierpont include "*sleep disturbance,* headache, tinnitus, ear pressure, dizziness, vertigo, nausea, visual blurring, tachycardia, irritability, problems with concentration and memory, and panic episodes associated with sensations of internal pulsation or quivering that arise while awake or asleep." *Id.* at 26. [Emphasis added.]

Dr. Christopher Hanning, a sleep disturbance expert, in his report, "Wind Turbine Noise" *Exhibit 28, supra*, reviewed and approved by a panel of professionals, concludes that "[t]here can be no doubt that ....industrial wind turbines ('wind farms') generate sufficient noise to disturb

the sleep and impair the health of those living nearby." *Id.* at 2.1.1. He explains that "[s]leep disturbance and impairment of the ability to return to sleep is not trivial as almost all of us can testify. In the short term, the resulting deprivation of sleep results in daytime fatigue and sleepiness, poor concentration and memory function. Accidents increase. In the longer term, sleep deprivation is linked to depression, weight gain, diabetes, high blood pressure and heart disease." *Id.* at 2.2.9.

Most recently, in a peer reviewed, National Institute of Health funded study, Dr. Alec Salt and Timothy Hullar, "Responses of the Ear to Low Frequency Sounds, Infrasound and Wind Turbines, (June 2010)" submitted by Friends of Spruce Mountain, DEP Order at 12, the authors point out that symptoms reported by some people close to wind turbines "include sleep disturbance, headaches, difficulty concentrating, irritability and fatigue, but also include a number of otologic symptoms including dizziness or vertigo, tinnitus and sensation of aural pain or pressure." *Id.* at 3.

There is substantial amount of additional evidence in the record to support these findings and why it occurs for wind turbine noise more than other kinds and at what dB levels.

Recently the peer reviewed World Health Organization ("WHO"), *Night Time Noise Guidelines for Europe* (2009), *Aggrieved Parties Exhibit 26*, concluded that "[t]here is plenty of evidence that sleep is a biological necessity, and disturbed sleep is associated with a number of health problems." *Id.* at XI. Also, it concludes that "noise induced sleep disturbance is viewed as a health problem in itself (environmental insomnia)." *Id.* at XII. It also concludes that sleep disturbance also leads to further consequences for health and well-being." *Id.* In Section 2 of the

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Guidelines the consequences of sleep deprivation are summarized. *Id.* at 23 (Table 2.4). Some of the short term consequences are sleepiness, mood changes, irritability and nervousness, impairment of function, increased metabolic rate and thyroid activity, immune function impairment, and some of the long term consequences are depression/mania, violence, difficulty learning new skills, increased sensitivity to pain and susceptibility to viral illnesses. Based on the extensive research done, the 2009 WHO *Guidelines* concludes that sleep disturbance from noise occurs between 30 to 40 dB. *Id.* at XIII (table 1) and XVI-XVII (including Tables 3 and 4). Based on these findings, the 2009 WHO *Guidelines* recommend that noise levels at night should not exceed 40 dB during the night "[f]or the primary prevention of subclinical adverse health effects." *Id.* at XVIII.[1]

The WHO *Guidelines* does not address wind turbine noise. However, that fact does not detract from the significance of its findings. To the contrary, it makes the report especially relevant because wind power noise poses a *greater risk factor* than other sources of industrial noise addressed in the WHO *Guidelines.*

It is universally recognized today that noise generated by wind turbine facilities is more annoying than other sources of industrial noise. The internationally renowned expert, Dr. Eja Pederson from Sweden, is most often cited for this proposition. In her peer reviewed article, E. Pederson & K. Waye, "Perception and Annoyance Due to Wind Turbine Noise – A Dose-Response Relationship," 116 J. *Acoust Soc. Am.* 3460, 3467 (2004), *Aggrieved Parties Exhibit 17*, the authors state that "the results[of their study] suggest that the proportions of respondents

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[1] *Also see*, The Maine State Planning Office ("SPO") Technical Assistance Bulletin # 4 (2000), *Aggrieved Parties Exhibit No. 16,* warns against the "serious threat to human health, especially when resulting from in sleep interruption and especially during the nighttime hours," from prolonged exposure to noise.

annoyed by wind turbine noise are higher than for other noise sources *at the same A-weighted SPL* and that the proportion annoyed increases more rapidly." [Emphasis added.] The conclusions were graphed as follows:

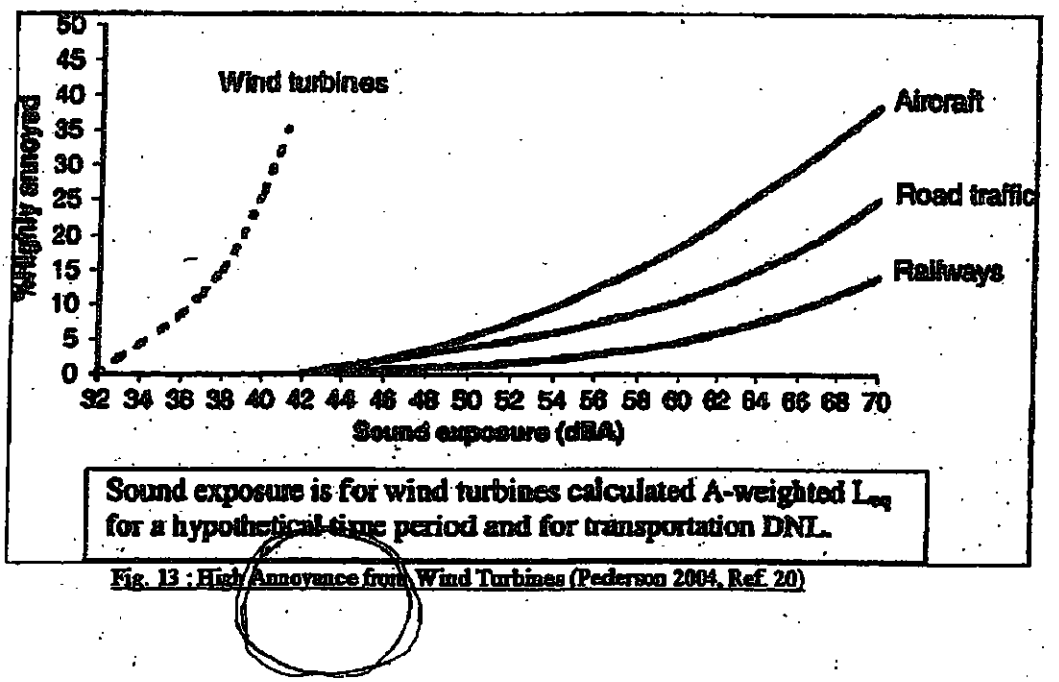

Fig. 13 : High Annoyance from Wind Turbines (Pederson 2004, Ref. 20)

Id. at 3468. This graph shows support for the DEP Noise Rule limit for night time noise in quiet areas at 45 dBA for industrial noise from aircraft, roads and railways, but shows the inadequacy of the sound limit for wind turbine noise as it causes annoyance at much lower limits. The conclusions of Dr. Pederson are reaffirmed in EU financed study, G.P. van den Berg, Eja Pedersen, Jelte Bouma & Roel Bakker, " WINDFARMperception - Visual and Acoustic Impact of Wind Turbine Farms on Residents," June 3, 2008 , *Aggrieved Parties Exhibit 22,* at 61 ("Perhaps the main finding is that wind turbine sound is relatively annoying, more so than equally loud sound from aircraft or road traffic."). The Pederson chart and her findings are

frequently cited by others, including Dr. Christopher Hanning, "Wind Turbine Noise", *Exhibit 28, supra*, and even the Director of the MCDC, Dr. Dora Mills, in emails to and from the DEP, *Aggrieved Parties Exhibit 5,* addressed in Exhibit A hereto at 3.

The most common explanation of why wind turbine noise is regarded as more annoying than other industrial sources at the same sound pressure levels is that wind turbine noise is so often characterized by a pulsating, throbbing noise blade swish called "amplitude modulation." *See,* Pederson & Waye, *Exhibit 17, supra,* at 3468 ("Wind turbine noise was perceived by about 85% of the respondents *even when the calculated A-weighted SPL were as low as 35 0- 37.5 dB.* This could be due to the presence of amplitude modulation in the noise, making it easier to detect and difficult to mask by ambient noise. This is also confirmed by the fact that the aerodynamic sounds were perceived at a longer distance than machinery noise.").[Emphasis added.] *See also,* G.P. van den Berg, "Low Frequency Noise and Vibration Control," 11th International Meeting on Low Frequency Noise and Vibration and its Control, "Do Wind Turbines Produce Significant Low Frequency Noise? " (2004), *Aggrieved Parties Exhibit11* at 8; G.P. van den Berg, et als, "WINDFARMperception, *Exhibit 22, supra,* at 57, 60, 61; SPO Bulletin # 4, *Exhibit 16, supra,* at 10 ("repetitive sounds are more annoying than multiband, constant noises."); George Kamperman & Richard James, "The 'How To' Guide to Siting Wind Turbine," *Aggrieved Parties Exhibit 8,* at 12 (amplitude modulation is a "characteristic of wind turbine sound that increases sleep disturbance potential above that of other long-term sources."); Eja Pedersen and Kerstin Waye. "Wind Turbines-Low Level Noise Sources Interfering With Restoration?" *Environmental Res. Lett.* 3 (2008), *Aggrieved Parties Exhibit 18;* Eja Pedersen, G.P. van den

Berg, Roel Bakker & Jelte Bouma. "Response to Noise from Modern Wind Farms in the Netherlands," 126 *J Acoust. Soc. Am.* 634, 635 (2009), *Aggrieved Parties Exhibit 19* ("Amplitude – modulated sound is more easily perceived than is a constant –level sound and has been found to be more annoying."); Kerstin Waye. "Perception and Environmental Impact of Wind Turbine Noise," Inter-Noise 2009, *Aggrieved Parties Exhibit 24;* Geoff Leventhall, "Low Frequency Noise. What We Know, What We do not Know and What We would Like to Know, " 28, J. of Low Frequency Noise, Vibration and Active Control, 79, 97 (2009), *Aggrieved Parties Exhibit 1,;* and C. Hanning, "Wind Turbine Noise", *Exhibit 28, supra,* at ¶2.2.4; Dr. Aniel Affidavit, *Exhibit 7, supra,* at ¶6.h.

A second explanation why wind turbine noise is more annoying than other sources of industrial noise is that wind farms are often located in quiet, rural settings where pre-existing ambient noise levels are low. Pederson & Waye, *Exhibit 17, supra*, at 3468: "[a]nother factor that could be of importance for explaining the seemingly different dose-response relationships is that the wind turbine study was performed in a rural background, where a low background level allows perception of noise sources even if the A-weighted SPL are low." *See also*, Waye, *Aggrieved Parties Exhibit 24* at 2-3 (ambient sound needs to be about 10 dB above that of wind turbine sound to mask it); Pederson & Waye, *Exhibit 17, supra,* at 2; E. Pederson, et als., "Wind Turbine Low Level Noise," *Exhibit 18, supra*, at 4; and Kamperman & James, *Exhibit 8, supra,* at 13-14.

A third reason why wind turbine noise is considered more annoying than other industrial sources is because of its low frequency content. Low frequency noise is typically in the range of

10 Hz to 100 Hz, although it can be extended an octave at each end of this to 5 Hz to 200 Hz. Geoff Leventhall, "Low Frequency Noise," *Exhibit 15, supra*, at.79. Wind turbines contain a significant amount of low frequency noise. Kamperman & James, "The "How To" Guide," *Exhibit 8, supra*, at 4-5. This was recognized by the DEP in a Memorandum from Andrew Fisk to Commissioner David Littell, dated January 10, 2008, made part of the *Report of the Governor's Task Force on Wind Power Development* as Exhibit I ("Noise generated from wind turbines does have attributes that warrant particular focus in the review of projects, including low frequency modulating noises generated as turbine blades pass by towers."). It is even recognized by Dr. Dora Mills, in her report, "Wind Turbine Neuro-Acoustical Issues" (June 2009), relied upon by the DEP Order in this case. She states in this report:

> Some have pointed to LFN [low frequency noise] emitted from wind turbines as a possible source of adverse health effects. The reasons LFN are focused on include: LFN encounter less absorption as they travel through the air than higher frequency sound, so they persist for a longer distance; the amount of sound transmitted from outside to the inside of a building is higher with LFN; and some models for assessing impact of noise do not adequately include LFN.

Id. at 3. [Emphasis added.] *See also*, Exhibit A hereto at 2 (Dr. Mills forwards a Canadian study to Commissioner Littell that explains that A-weighted measurements do not reflect the full annoyance potential and that residents who are impacted by low frequency noise may suffer from sleep disturbance and in some cases chronic fatigue.) Even Geoff Leventhall, a prominent supporter of wind power, in his peer reviewed article, "Low Frequency Noise," *Exhibit 15, supra*, stresses that "annoyance from the low frequency noise [is] greater than that from higher frequency noise at the same A – weighed level" and that "[a]t equal A-weighted levels, *the noise*

dominated by the low frequency component was perceived as 4-7B louder and 5-8dB more annoying."Id. at 86. [Emphasis added.]

The significance of low frequency noise was also addressed by the WHO, *Guidelines on Community Noise* (1999). *Aggrieved Parties Exhibit 27.* These *Guidelines* point out that the health effects due to low- frequency components are estimated to be more severe than for community noises in general." *See also,* Kamperman & James, "The 'How To'Guide," *Exhibit 9. supra,* at 14 describing additional findings of the 1999 WHO *Guidelines* that low frequency justifies lower regulatory limits.

The 2009 WHO *Guidelines, Exhibit 26, supra*, 62, while not addressing wind turbine noise, does explain the general principle that annoyance plays a prominent role in the indirect pathways to adverse health effects from noise, as illustrated in the following chart:

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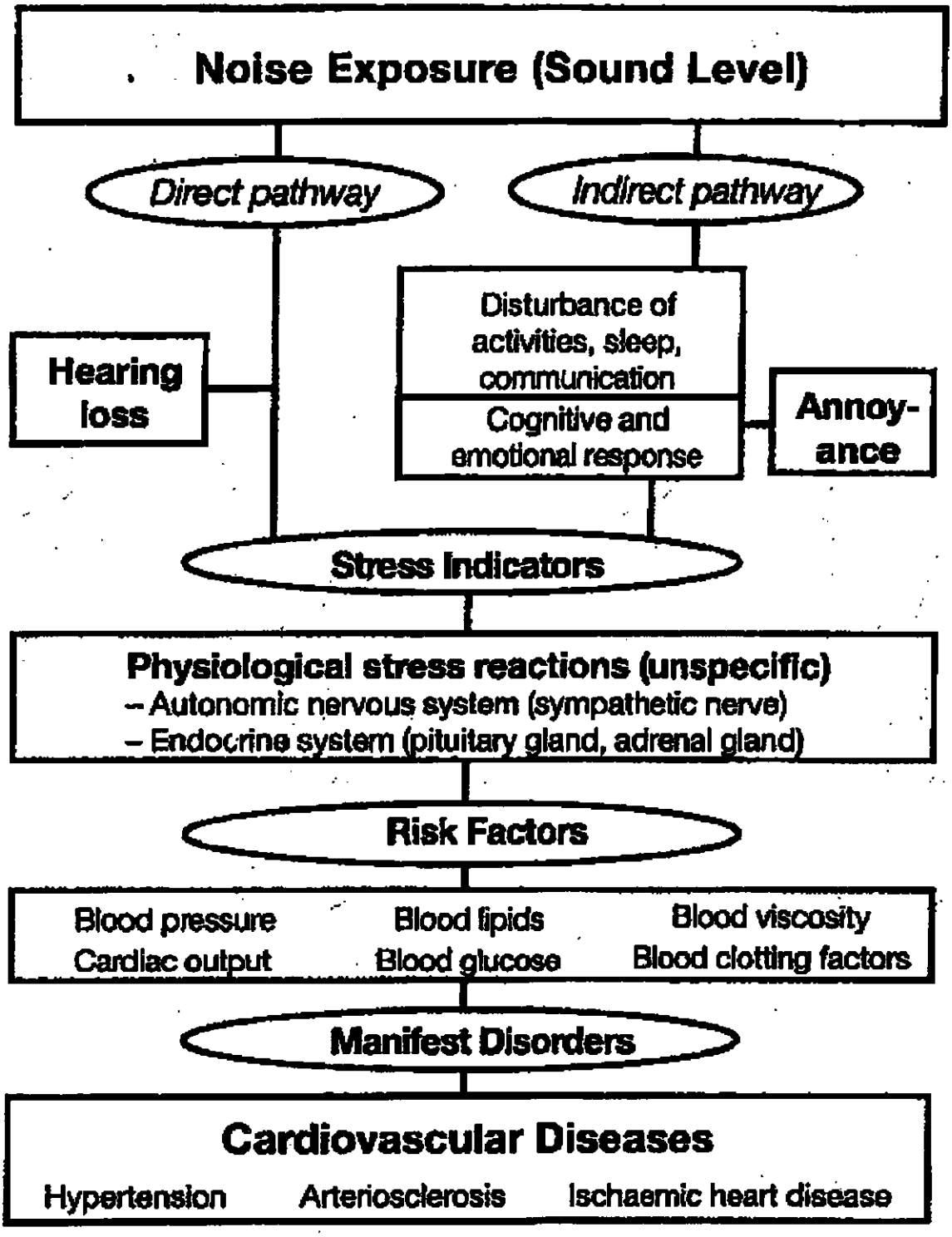
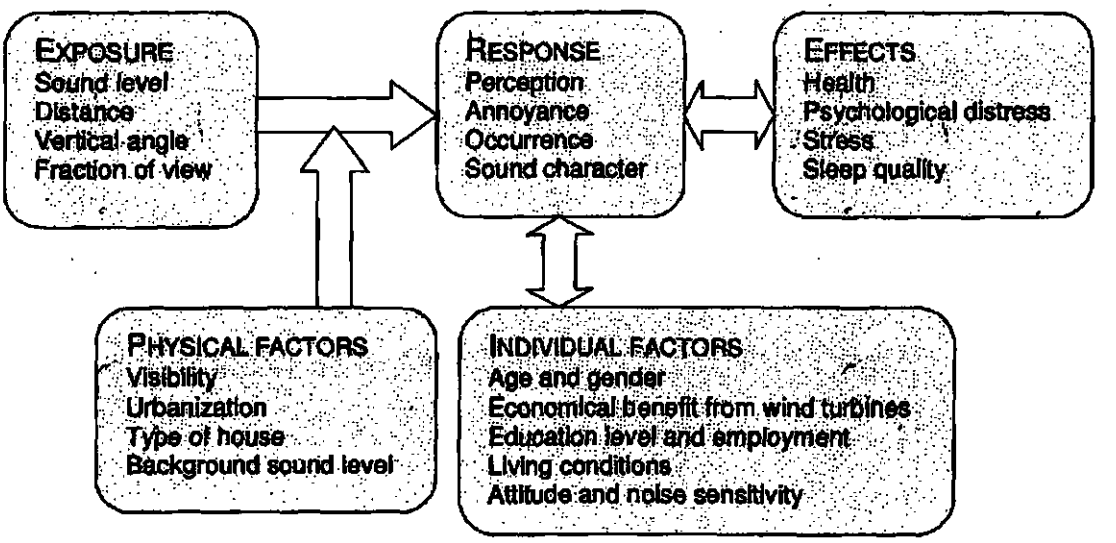

Noise Exposure (Sound Level)
Direct pathway
Indirect pathway
Hearing loss
Disturbance of activities, sleep, communication
Cognitive and emotional response
Annoy-ance
Stress Indicators
Physiological stress reactions (unspecific)
– Autonomic nervous system (sympathetic nerve)
– Endocrine system (pituitary gland, adrenal gland)
Risk Factors
Blood pressure
Cardiac output
Blood lipids
Blood glucose
Blood viscosity
Blood clotting factors
Manifest Disorders
Cardiovascular Diseases
Hypertension
Arteriosclerosis
Ischaemic heart disease

A similar chart showing the role of annoyance from wind turbines in relation to adverse health effects was prepared by van den Berg, et als. in the EU financed study,"WINDFARMperception, " *Exhibit 22, supra*, at 23:



The same authors point out that "the stress scores, difficulties to fall asleep and sleep interruption were associated with annoyance due to wind turbines ..."*id.* at 55, *see also id.* at 57 ("wind turbine sounds leads to annoyance for some people; annoyance that in turn possibly hinders psycho-physiological restoration and increases the level of stress.") and Pederson & Waye, "Wind Turbine – Low Level Noise," *Exhibit 18, supra* at 1 ("the prevalence of noise annoyance [is], apart from the sound pressure level, strongly related to disturbed rest" and "[i]nhibited restoration or hindrance of psychological stress recovery due to disturbance from noise sources is today believed to have an important impact on not only mood but more long term health consequences.") and E. Pederson, "Effects of Wind Turbine Noise, *Exhibit 21, supra*, at 10 ("Stress was in these studies not directly associated with A-weighted sound pressure levels, but

with noise annoyance. There was a remarkable consistency among the studies for the relationship between feeling tense or stressed and annoyance.") It has Also has been recognized that annoyance on its own is an adverse health effect. Pederson & Waye, "Wind Turbine Low Level Noise," *Exhibit 18, supra* at 20.

This Board has stated in the last two appeals of wind turbine approvals by the DEP -- in the Record Hill Board Order dated March 18, 2010 at 11 and in the Oakfield Board Order dated June 11, 2010 -- that it "recognizes that noise emitted from the proposed project[s] has a potential to be heard at an audible level from protected locations and the noise generated by the Record Hill Wind Project [and the Oakfield Wind Project] may be deemed as an annoyance depending on a person's level of intensity." The turbines in Spruce Mountain Project are sited in approximately the same distance from protected residential locations as in Oakfield and closer than Record Hill, but based on the extent of NRO mandated as a condition of the license in this case, it is logically more likely that the Spruce Mountain Wind Project will cause more annoyance, sleep disturbance and secondary adverse health effects than either Record Hill or Oakfield. Therefore, the Board should make the same finding in this case and, based on that finding, in conjunction with the expert opinions and studies and reports reviewed above, should take additional steps to assure that the Project will not cause adverse health effects because of excessive noise.

B. The DEP Noise Rule Sound Level Limits Do Not Provide Adequate Protection Against Noise Generated from the Spruce Mountain Wind Project.

The DEP Noise Rule was last amended 21 years ago in 1989. The Rule makes no

reference to noise propagated from industrial grade wind power projects. Back in 1989 the issue of wind power was not raised when the rule was amended, presumably because no one was approaching the DEP to license a wind turbine project under the Site Law in 1989. The existing DEP Noise Rule does not adequately protect against adverse health effects from noise, given its unique characteristics, for the reasons to be explained below. It has failed to protect the citizens of Mars Hill, Freedom and Vinalhaven. Aniel Affidavit, *Exhibit 2, supra,* at ¶7. Because of this, Petitioners ask that the Board exercise its authority under Section 375.10.E of the DEP Noise Rule. This provision allows the Board to establish, "as a term or condition of approval, any reasonable requirement to ensure that the developer has made adequate provision for the control of noise from the development and to reduce the impact of noise on protected locations. Such conditions may include, but are not limited to, imposing limits on hours of operation...."

1. High Frequency Sound Level Limits are Too High for Wind Turbine Noise.

The high frequency Sound Level Limits of 45 dBA set forth in Section 375.10.C(1) (a)(v) of the DEP Noise Rule for quiet area night time noise is too loud for wind turbine noise. Nissenbaum Affidavit, *Exhibit 1, supra,* at ¶27.a. As explained above, the 2009 WHO *Guidelines* finds that sleep disturbance occurs at dBA levels of 30-40 dBA and that is for general transportation noise, not wind turbine noise, which produces annoyance leading to health effects in the lower end of that range. For wind power noise, Dr. Nissenbaum states that the 2009 WHO *Guideline* range should be used; more specifically he recommends 35 dBA. Nissenbaum Affidavit, *Exhibit 1, supra,* ¶s 6 and 26. Kamperman & James, "The 'How To' Guide", *Exhibit 8, supra,* at 15 also recommends 35 dBA. Dr. Hanning, in "Wind Turbine Noise," *Exhibit 28,*

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supra, at 4.4.2 agrees. The Pederson studies and the others cited above measuring significant annoyance levels below 40 dB are further support for the need to protect against wind turbine noise below the 45 dBA set by the DEP Noise Rule and below 40 dBA. Even Dr. Mills, despite her politically tainted support for wind turbines, had to acknowledge in private that she had a "hard time" defending the DEP Noise Rule allowing 45 dBA in rural settings that did not protect the residents of Mars Hill. Exhibit A hereto at 4.

2. The Absence of Setbacks.

The DEP Noise Rule does not set any setback limits to protect against the adverse health effects of noise. Dr. Pierpont recommends a setback of 1.24 miles and 2.0 miles for ridge mounted turbines. Wind Turbine Syndrome, *Exhibit 23, supra*, at 20. Dr. Nissenbaum recommends 2000 meters, *Exhibit 1, supra,* at 6. Dr. Aniel recommends 1 mile. *Exhibit 2, supra,* at ¶6. Dr. Hanning recommends 1.5 km. *Exhibit 28, supra,* at ¶4.3.3.

3. No Measurements of Low Frequency Noise.

As explained above, low frequency noise emitted by wind turbines is more annoying and travels further and penetrates homes more and is more threatening to human health than higher frequency noise. Yet under the DEP Noise Rule low frequency noise is filtered out of the A-weighted measurement requirements in the Rule. Even Dr. Mills of the MCDC admits this. *See, supra* at 21. *Also see,* Leventhall, "Low Frequency Noise," *Exhibit 15, supra* at 95. If, as Leventhall concludes, low frequency dominated noise is 5-8 dB more annoying than high frequency noise at the same sound pressure level, the DEP Noise Levels are too high by at least that amount, providing additional support for the 35 dBA limit discussed above. According to

Leventhall, "[t]he absence of measurement requirement for ... low frequency noise ... leads to long term stress effects.... '*Id.* He adds, that "chronic psychophsiological damage may result from long-term exposure to an audible, low level frequency noise, which is left uncontrolled, despite complaints." *Id.*

4. Inadequate Control of Amplitude Modulation.

The DEP Noise Rule takes amplitude modulation into account but only for noise that qualifies as SDRS and even noise so qualified is folded into an hour long measurement, rendering a finding of SDRS irrelevant for protection purposes. As Leventhall explains, when the government averages amplitude modulation into an average noise level over a period of time, an important feature of the noise (amplitude modulation) becomes lost. *Id.* at 97.

5. Lack of Limits Related to Background Ambient Noise.

Finally, the DEP Noise Rule does not create limits for wind turbine noise by a defined increase over pre-development ambient background noise. Nissenbaum Affidavit, *Exhibit 1, supra,* ¶27.a. All that it does is set quiet time limits of 45 dBA when the ambient pre-development noise is 35 dBA. However, that allows a 45 dBA level of noise in the nighttime in rural areas where it is common to have ambient noise as low as 20 dBA. SPO Bulletin # 4, *Exhibit 16, supra,* at 1. That would be impermissible in states such as Massachusetts that limit wind turbine noise to 10 dBA over pre-development ambient noise.[2] *See*, the MCDC *Wind*

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[2] The Basis Statement for the 1989 amendments to the Noise Rule points out that the rule was amended "so that developments will produce, in most cases, no more than 15 dBA increase in ambient sound levels at protected locations" given that a higher increase "would have a significant impact on existing noise levels and to individuals living near a development." *Id.* Response to Comments 14 and 12. The Basis Statement further states that the amendment allows sound levels to increase more than 15 dBA over pre-development ambient noise in very quiet rural areas "based on the premise that relatively few inhabitated areas of the state would have background levels

Turbine Neuro-Acoustical Issues dated June 2009 (the "Q&A") at 4 (Basic Wind Turbine Noise Related Resources") and Exhibit A hereto at 2. Kamperman & James, "The 'How To' Guide," *Exhibit 8, supra* at 14 recommend a limit of 5 dBA over background ambient noise.

6. Conclusions

Petitioners do not ask the Board to invalidate the DEP Noise Rule or to create a new noise rule in these proceedings. They simply ask the Board to exercise the authority it has under Section 375.10 E of the DEP Noise Rule to take additional steps to protect against the adverse health effects from the noise expected from the Spruce Mountain Wind Project. In this case adequate protection would prohibit the Project from operating during the hours of 7.00 p.m. to 7 a.m.

C. The Reasons in the DEP Order for not Taking Additional Measures to Protect Against the Adverse Health Effects of Wind Power Noise Are Not Valid.

The DEP Order states three reasons for concluding that no additional measures are necessary to protect against the adverse health effects of noise expected from the Spruce Mountain Wind Project. One is the opinion of Dr. Dora Mills, Director of the Maine CDC, second, is the conclusion of two recent scientific literature reviews on health effects of wind turbine noise, and the third is the view of Dr. Mills and Enrad as to the significance of the 2009

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lower than 30 dBA at night and 40 dBA during the day." *Id.* Response to Comment 14. [Emphasis original.] Woodstock is inhabited and the pre-development ambient noise levels were measured by Tetra tech ---- as low as ---- -dBA, which is 19 dBA lower than the 45 dBA Sound Level Limits allowed for nighttime in quiet area under the DEP Noise Rule. RSE, *Sound Level Assessment, supra,* at 12, Table 6-1.

WHO *Guidelines*. None of these reasons are valid.

1. MCDC Position on Wind Turbine Noise is not a Basis for Refusing to Protect Against Health Effects.

The DEP Order at 12 states that the DEP relied upon the views of Dr. Mills included in her Q & A published on the MCDC website that found she found "no evidence in peer-reviewed medical and public health literature of adverse health effects from the kinds of noise and vibrations heard by wind turbines other than occasional reports of annoyance, and these are mitigated or disappear with proper placement of the turbines from nearby residences." *Id.* at 12. The DEP Order added that Dr. Mills had reviewed the materials submitted by interested parties pertaining to the health issues and none of these altered her "earlier analysis and comments to the DEP on the issue." *Id.* These reasons are not valid for a number of reasons.

First, Dr. Mills' "analysis" of wind turbine noise as set forth in the MCDC website has been shown to be politically tainted by a series of e-mails obtained by Petitioners from a Freedom of Access request. *See Aggrieved Parties Exhibit 5*. A review of this exhibit has been set forth in prior submissions to the Board in the appeals of other DEP Orders in the Record Hill Wind and the Oakfield Wind Projects and will not be repeated here. The analysis is set forth in Exhibit A hereto.

Second, the claim that Dr. Mills "reviewed the materials submitted by interested parties" on the subject of the health effects is not credible. There were 31 exhibits of considerable length submitted by the undersigned and another one by Friends of Spruce Mountain itself. The record in this case indicated that the exhibits were sent to Dr. Mills on Wednesday, September 22, 2010,

and she responded on Saturday, September 25, 2010. It is possible, but unlikely, that Dr. Mills gave any serious review of these materials in this short time frame, especially against the background of her failure to review such materials in the past.[3] If she really did carefully review the 32 exhibits, including the peer reviewed article by Dr. Salt that specifically mentions adverse health effects from wind turbine noise, and was totally unmoved to make any comments on the subject, it is only a testament to how much her mind is closed on the subject for the political reasons.

In addition, Dr. Mills views expressed in the DEP Order do not give credible support for the refusal of the DEP to require more protection against adverse noise.

For one thing, there is no evidence that she actually reviewed the details of the Spruce Mountain Wind Project, including the sound assessment, the peer review by Enrad and the follow up memorandum and correspondence by Tetra Tech. The DEP Order states that Dr. Mills was dismissive of all the reports and studies submitted by interested parties, but has provided no evidence or even a claim that Dr. Mills actually examined the siting of this specific project. This is important because in her "analysis" she states that the health effects of wind power noise depend on the "proper placement of the turbines from nearby residences." More specifically, in her Q & A, *supra* at 2 Dr. Mills states:

> It appears from the research that distance from the wind turbine, height of the wind turbine relative to the surrounding topography, the quality of the sound *(repetitive low frequency sound)*, wind conditions, and wind direction all affect how the wind turbine noise affects people. Research done on wind turbines, airport and other sources of noise indicates that annoyance levels are difficult to

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[3] In the Record Hill Wind case Dr. Mills gave no consideration to petitioners exhibits. In the Oakfield Wind case she "scanned" a few of the noise exhibits but was too busy to do much more.

> assess. However, taking in account the above factors as well as careful measurements need to be considered when siting wind turbines near residential properties. [Emphasis added.]

There is nothing in the record that shows that Dr. Mills gave any consideration to any of the factors she lists above in connection with the Spruce Mountain Wind Project.

Second, the opinion of Dr. Mills set forth in the DEP Order that she could find no peer-reviewed literature of adverse health effects from wind turbines, DEP Order at 12, is undercut by her private admission to Commissioner Littell that "there are no firm statements I could find from non-industry sources stating that there are no adverse health effects from wind turbines." Exhibit A hereto at 2. Moreover, Dr. Mills is in error in her opinion on the absence of peer reviewed literature. *See,* Nissenbaum Affidavit , *Exhibit 1, supra,* at ¶9, and Exhibit C to his affidavit and studies cited above, including the recent peer reviewed study by Dr. Salt.

Third, the qualification of her opinion that wind turbine noise does produce noise that can adversely affect health is subject to a qualification – "other than occasional reports of annoyance" – that is both is unsupported and misleading. There is no support in the literature that annoyance from wind turbines is merely "occasional" and none is cited. To the contrary, there is extensive literature on the prevalence of annoyance by those living nearby wind turbine projects, much of which is cited above and some of which is referenced in Dr. Mills' communications with Commissioner Littell on the subject. Q & A at 3. *See also* Exhibit A at 2-4, where Dr. Mills notes Swedish studies showing that "increased annoyance was associated with lower sleep quality and negative emotions." In fact, in her communications with Commissioner Littell, she specifically set out the graph of Dr. Pederson showing how much more annoying

wind turbine is than other sources of industrial noise. *Id.* at 3.

In addition, Dr. Mills' inference that "annoyance" is trivial is contradicted by the studies reviewed above, some of which Dr. Mills references in her Q & A at 3. Dr. Nissenbaum explains that "annoyance is one of the root causes of sleep disturbance." *Exhibit 1, supra,* at ¶13. He further explains that "'Annoyance' in the context of Industrial Wind Energy facilities is not only a critical physiologic stressor and resultant symptoms and medical disorders, it is by no means 'occasional,' as claimed by the MCDC. Annoyance causes sleep disturbance and when sleep disturbance is chronic -- which will happen when turbines are sited too close to residents because turbine noise at night is in fact chronic, it is there much of the time, week after week, month after month, year after year – it results in sleep deprivation. Sleep deprivation will result, as surely as day follows night, in a host of adverse symptoms and, over time, diagnoses of real medical conditions. This is not conjecture. This is simple, known, medical fact. Additionally, the logic employed by the Maine CDC is faulty: Everyone knows that intrusive noise causes sleep disturbance. Physicians, and some lay people, additionally, know that chronic sleep disturbance is sleep deprivation, and sleep deprivation has a host of acute, subacute, and chronic adverse health effects. Most of the symptoms described by the sufferers at Mars Hill are attributable to sleep deprivation. This includes headaches, changes in weight, psychiatric symptoms, cognitive dysfunction, possible increases in blood pressure, and the like in the near and medium term. Chronic effects, which have yet to be seen (it is too early, yet) may include, in the fullness of time, effects such as diabetes and heart disease. " Affidavit of Dr. Nissenbaum, *Exhibit 1, supra* at ¶s 13-16.

Dr. Mills' views on annoyance also ignore the peer reviewed findings in the 2009 WHO *Guidelines* showing annoyance as included in the indirect pathway to adverse health effects from exposure to excessive noise. *See* chart as 24 *supra*. Further, in her private conference call with DEP in March 2009, *see Notes, Exhibit* 4, *supra*, at 3, Dr. Mills pointed out that in Europe, according to the WHO, "annoyance" results in "adverse health effects." *See also,* comments by Warren Brown, *id.*, at 5 ("Lots of studies in Denmark/Netherlands .... show annoyance is an issue.")

2. It was not Reasonable for the Board to Rely on Biased, Industry Studies Dismissing Health Concerns.

The DEP also should not have relied upon the biased wind industry position papers for the proposition that wind turbines do not produce adverse health effects to residents. *See, DEP* Order, *supra*, at 12-13. These position papers are biased and ignore credible reports to the contrary. The reports relied upon -- Exponet, Inc., "Evaluation of the Scientific Literature on the Health Effects Associated with Wind Turbine and Low Frequency Sound," and the American Wind Energy Association and the Canadian Wind Energy Association "white paper," "Wind Turbine Sound and Health Effects," are industry advocacy pieces, with participants handpicked by the industry based on their known biases. Neither report is peer reviewed or reviewed at all externally, and there is no original research contained in either report. Most significantly, neither report specifically denies (or even addresses) the WHO 1999 or 2009 *Guidelines* or other evidence of recent consensus of the dangers of sleep disorders, choosing instead to focus on annoyance and visceral vibratory vestibular disturbance and other related issues. Most significantly, both reports acknowledge that wind turbine noise causes sleep disturbance. *See* the

Exponent Report, *supra*, at 40 and the AWEA/CWEA paper, *supra*, at 3-12 (section 3.3), 3-16 (section 3.4.2) and 4-3 (section 4.1.2).

In a report issued in January 11, 2010, by the Society for Wind Vigilance, published "An Analysis of the American/Canadian Wind Energy Association Sponsored Wind Turbine Sound and Health Effects, An Expert Panel Review," December 2009, *Aggrieved Parties Exhibit 29*, a panel of doctors point out that the AWEA/ CWEA position paper "acknowledges that wind turbine noise may cause annoyance, stress and sleep disturbance and that as a result people may experience adverse physiological and psychological symptoms. It then ignores the serious consequences." *Id.* at 3. The Society for Wind Vigilance further concluded that the industry white paper is "neither authoritative nor convincing. The work is characterized by commission of unsupportable statements and the confirmation bias in the use of references. Many important references have been omitted and not considered in discussion. Furthermore the authors have taken the position that the World Health Organization standards regarding community noise are irrelevant to their deliberation – a remarkable presumption." *Id.* at 2. The Society for Wind Vigilance concludes that:

> There is no medical doubt that audible noise such as emitted by modern upwind industrial wind turbines sited close to human residences cause significant health effects. These effects are mediated through sleep disturbance, physiological stress and psychological distress. This is settled medical science.

Id. Also see, Dr. Hanning, "Wind Turbine Noise," *Exhibit 28, supra,* at §3.11 (the authors of the report lack expertise in sleep medicine and psychology.)

To give but one example of the flaws of these reports, the Exponent Report, according to

the DEP Order, *supra* at 13, dismisses "annoyance" as an "elusive factor" that underlies health complaints. This flies in the face of the WHO 2009 *Guidelines* describing annoyance as an important indirect pathway for health concerns. Likewise, the AWEA/CWEA panel, as described by the DEP Order, argues that wind turbine noise has no "*direct* adverse physiological factors, "no *direct* adverse health consequences." *Id.* at 13 [Emphasis added.] This is a deceptive way of ignoring the 2009 WHO *Guidelines* chart, *supra at 24*, showing annoyance as an *indirect* pathway to health effects.

In summary, the DEP's seemingly desperate search to find ways to discredit the growing consensus of concerns about the health risks from wind power noise -- risks that have been experienced by every single project built to date in Maine close to residents -- by reference to industry biased and misleading industry white papers cannot be support for the DEP's findings.

3. Views of Der. Mills and EnRad on the 2009 *Guidelines* Recommendations for Sound Level Limits.

Finally the DEP Order recites the views of Dr. Mills and Warren Brown of EnRad that the recommendations of the 2009 WHO *Guidelines* for nighttime noise limits because the report's measurements differ from those required by the DEP Noise Rule. DEP Order at 13. These comments are not relevant because the Aggrieved Parties do not argue that DEP should adopt the Guidelines limits on nighttime noise. Rather they rely upon the Guidelines for the decibel levels at which sleep is disturbed, the role of annoyance as an indirect pathway to adverse health results and in the health consequences of sleep deprivation.

BASIS FOR THE APPEAL – OBJECTIONS TO DECOMMISSIONG PLAN

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Section B-13.6 (Submission requirements) of the Wind Power Act, P.L. 2007, Chapter 661, requires the DEP to specify requirements for decommissioning of wind turbine projects. The law requires "[d]ecommissioning plans [to] include[ ] demonstration of *current and future financial capacity that would be unaffected by the applicant's future financial condition to fully fund* any necessary costs commensurate with the project's scale, location and other relevant considerations, including, but not limited to, those associated with site restoration and turbine removal." [Emphasis added.]

In its Application, Section 29, the Applicant estimated that the cost of decommissioning 11 turbines will only be $294, 052, net of salvage recovery of $992,948. No detail is given as to how these costs or recoveries were calculated. The plan provides that up to 77% of the total cost of turbine decommissioning will be financed from scrap metal sales. No details are given as to the scrap prices that this estimate is based on. The DEP had no way of determining whether the total costs are reliable or not. Moreover, the Applicant does not plan to pre-fund the decommissioning plan, but rather proposes a phased in funding to be completed only in year 13 of operations. The DEP accepted the Applicant's decommissioning plan.

The Aggrieved Parties appeal the DEP Order as it relates to the decommissioning plan on two grounds. First, Aggrieved Parties appeal the DEP Order that permits substantial funding of the decommissioning plan to be funded by unsubstantiated estimated recoveries for scrap. In *Aggrieved Parties Exhibit 32*, excerpt from Vermont Public Service Commission Order, *In re Deerfield Wind*, Dkt. No. 7250, April 16, 2009, Vermont rejected the use of scrap recovery to fund a decommissioning plan for wind turbine project as being too unreliable. The Department

should do the same.

Second, the Aggrieved Parties appeal the DEP Order because it does not require pre-funding of decommissioning costs. It allows funding to be deferred entirely until operations begin and then allows incremental funding up through year 13. This plan, approved by the Department, is in direct conflict with the requirements for pre-funding in the Wind Power Act.

BASIS FOR THE APPEAL – OBJECTIONS TO FINDINGS ON VISUAL IMPACT

Finally, the Aggrieved Parties object to the findings of the DEP on visual impact. *See* DEP Order at 16-25. The basis for the appeal of these findings is set forth in the memorandum submitted to the DEP attached hereto as Exhibit B.

REQUEST FOR A PUBLIC HEARIING.

The Aggrieved Parties request a public hearing on the noise issue. It has demonstrated that there is at least "credible conflicting technical information regarding a licensing criteria," namely noise, as required by the DEP Procedural Rule, Section 7.B. The DEP states throughout the discussion on noise in its Order that it disagrees with the evidence of the Aggrieved Parties and it finds its own consultant and the Applicant to be more credible. Be that as it may, these findings do not mean there is no credible, technical and medical evidence that disagrees. What it means is that this is the occasion when a hearing must be held.

Summary of Testimony of the Aggrieved Parties at a Public Hearing.

The Aggrieved Parties will have Richard James and Dr. Michael Nissenbaum address the conflict in the technical evidence on the subject of noise measurements and health effects after experts of the Applicant and the DEP are cross examined. There rebuttal testimony will be based

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on the Report of Richard James, *Exhibit 3, supra*, and the Affidavit of Michael Nissenbaum, *Exhibit 1, supra.*

RELIEF REQUESTED

The relief requested by the Aggrieved Parties is for the Board to void the DEP Order granting permits to Spruce Mountain Wind and send it back to the DEP to require that the Applicant demonstrate that the Project will not exceed 35 dBA in the nighttime and will not exceed 5 dBA in excess of pre-development background sound levels and will not site turbines within a mile a residence, or, alternatively, require the Applicant to shut down the wind turbines at night, to require the Applicant to fully fund the decommissioning plan prior to the commencement of operations, without regard to any recoveries for scrap metal, and finally to require the Applicant to address and offer solutions to the visual impact objections to the DEP Order.

Respectfully submitted.

Dated: November 3, 2010

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EXHIBIT A TO APPEAL OF FRIENDS OF SPRUCE MOUNTAIN, ET ALS TO THE MAINE BOARD OF ENVIRONMENTAL PROTECTION

A packet of e-mails to and from Dr. Mills and the DEP produced in response to a Freedom of Access request to the DEP, *Aggrieved Parties Exhibit 5,* numbered FOAA #s 1-60, reveal that the MCDC Report was not a forthright or credible analysis of the potential health impacts from wind turbine noise.

The e-mail trail begins February 10, 2009, after MCDC Director Dora Mills received a telephone call and an e-mail from a Dr. Albert Aniel of Rumford, Maine forwarding an open letter from the medical staff of the Rumford Hospital Medical staff, together with links to articles, noting literature emerging worldwide on the health effects of wind turbine noise on nearby residents and asking Dr. Mills for support of a moratorium on new permits for wind turbine projects until further research could be done on the health effects of wind turbines, including health hazards from low frequency noise. FOAA Response #1 and #12. Dr. Mills had three immediate responses to this communication. One was to admit that she was not familiar with the issue ("this is a new topic to me," FOAA # 5), second, while still uninformed on the subject, she took an advocacy position against health concerns from noise of wind turbines (from the outset she was looking for help "to refute the claims made by the Rumford medical staff," FOAA Response # 5) and three, she looked to DEP Commissioner David Littell and others at DEP involved in the licensing of wind turbine projects (Andrew Fisk, Mike Mullen, James Cassida) for assistance in refuting the health concerns of Dr. Aniel, FOAA Response # 11, # 15 ("[a]ttached is a vetted and edited version of your talking points on wind noise"), #s 16-30, #31, and #35-6, in a Q & A she was working on for public consumption. FOAA #s 16-30.

At the same time Dr. Mills sought to advocate *against* consideration of the public health concerns from wind turbine noise in her Q & A, she expressed in her e-mails privately harbored

concerns about the adequacy of DEP Noise Rule for purposes of addressing the specific issue of wind turbine noise. FOAA Response #s 5-7 and # 38. On February 11, 2009, she wrote DEP Commissioner Littell that she had run across a Massachusetts regulation prohibiting noise that exceeds 10 dBA over pre-development ambient noise and "two very recent articles from Canada proposing some *ways to address unique features of wind turbines* in measuring or setting standards for noise levels." FOAA Response #s 5-7. [Emphasis added.] One of the Canadian articles she found, which she forwarded to DEP Commissioner Littell, explained that "A-weighted measurements do not reflect the full annoyance potential" of industrial noise and that "[r]esidents who are impacted by LFN [low frequency noise] may suffer from sleep disturbances, headaches, and in some cases chronic fatigue." FOAA Response #s 6-7. She noted that the Maine Noise Rules had not been updated since 1989 and, acknowledging her lack of expertise in this area ("I'm sure DEP has experts, including yourself, who know a great deal more than I do about this subject"), she wanted to share this research with the DEP. FOAA Response # 9. Dr. Mills did not send these articles to Dr. Aniel (instead she sent him older articles questioning health issues from wind turbines FOAA Response #s 1-4), nor did she reference the "very recent" Canadian articles in a Q & A she began constructing for dealing with the press. FOAA Response #s 16-30.

As Dr. Mills worked on a public Q & A to refute the medical claims of the Rumford medical staff ("I started working on this very early (2 am) today, and have also been busy doing other things" FOAA Response # 11), she concluded that *"[t]here are no firm statements I could find from non-industry sources stating there are no adverse health effects from wind turbines...."* FOAA Response #s 11.[Emphasis added]. She assured Commissioner Littell that she would not disclose this finding to the public ("I did not state this in the Q & A"), *id*, but warned him that:

> [T]here may be room for improving the noise rules for developments to take into account wind farms. The last time these rules were updated appear to be 1989. Massachusetts has rules that take into account the change over ambient noise levels rather than a level cap [as used in the existing DEP Rules]. And, there are some proposals from Canada that take into account low frequency noise emissions. However, that being said, *I am not a noise expert* and Maine is fortunate to have statute and rules on noise levels in place, give that many states do not.

FOAA Response # 11. [Emphasis added.]

The e-mail packet received in the Freedom of Access Request also included a chart prepared by the well known Swedish researcher, Eja Pederson, whose multiple wind turbine noise studies can be found on the Internet, showing how sharply different and more annoying wind turbine noise is than from other sources of noise, such as aircraft, road traffic and railways.

FOAA Response #13:

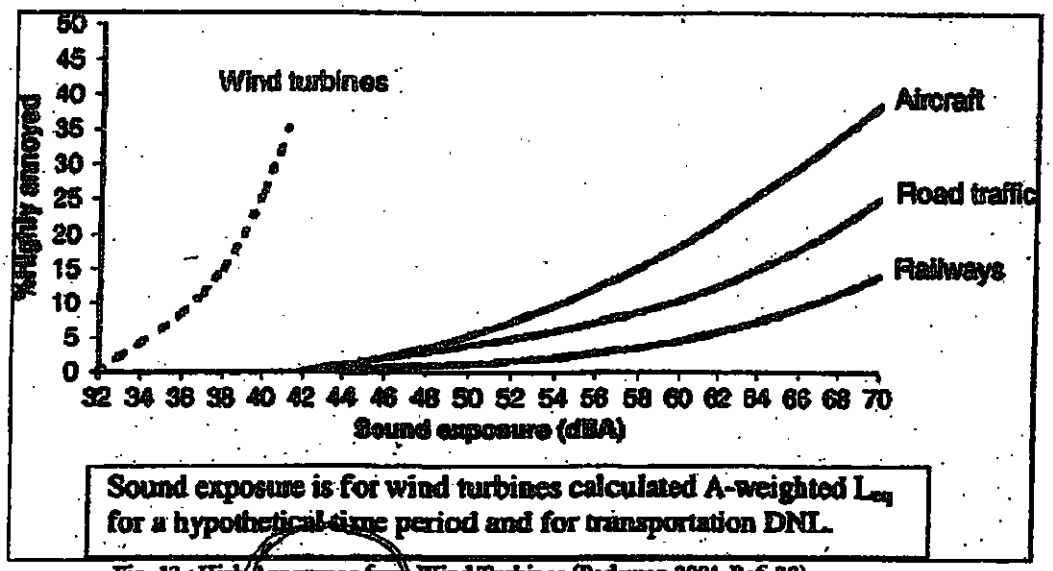

Fig. 13 : High Annoyance from Wind Turbines (Pederson 2004, Ref. 20)

This same Eja Pederson is the one that Dr. Mills cited in the first day of her review of the subject

of wind turbine health effects as the author of a survey in Sweden finding that annoyance increased with increased sound pressures, that "increased annoyance was associated with lower sleep quality and negative emotions" and that "[a]nnoyance levels were found at relatively low SPLs." FOAA Response #2.

And there is more in these emails. They recount that Dr. Aniel took his public health concerns about the need for a moratorium on new wind projects to the Maine Medical Association for support. FOAA Response # 38, 40-1. In the context of this development, Dr. Mills asked Commissioner Littell for help on February 25, 2009 in refuting this effort because she was having

> a hard time addressing ... the DEP regulations on noise levels, essentially being 45 dbl (sic.) at the property line in rural areas, and the fact that these regulations did not protect residents in Mars Hill who are perceived by some to be living too close from an annoyance perspective from the wind turbine farm there.

FOAA Response # 38. In the very next e-mail, Dr. Mills anxiously asks Andrew Fisk for updates on "how the DEP is addressing noise issues" because "[t]his issue seems to be gaining traction." Response FOAA Response #40.[1]

In summary, the candid views of MCDC's assessment of the health effects of noise revealed by the Freedom of Access responses establish that (1) that Dr. Mills admittedly lacks expertise on the subject of wind power noise, (2) that, even before she had the opportunity to

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[1] The e-mail trail further reveals that Dr. Mills talked at length with Dr. Peter Rabinowitz, Associate Professor of Medicine at the Yale School of Medicine and Director of Clinical Services in Occupational and Environmental Medicine at Yale, who told Dr. Mills that *"the increasing expressed concerns about noise and health effects related to wind turbines, especially as they relate to low frequency noise, needs to be addressed with some non-biased research."* FOAA Response, *supra*, JA-184 at #48. [Emphasis added.] Near the end of the e-mail trail there is a joint letter from Dr. Nissenbaum and Dr. Aniel to Dr. Mills (doctor to doctor) with an impassioned plea for the MCDC to take the health issues of wind power noise seriously, especially in light of the suffering of residents of Mars Hill, which Dr. Mills passes on to Commissioner Littell with a note that she will respond but give the Commissioner input in the response. FOAA Response #s 53-54. (The response was not included in the response to Appellants' FOAA request).

educate herself on the subject, she and the DEP worked together to present a public position dismissive of the health issues, perhaps, as she later acknowledged, because she "feel[s] quite strongly in support of wind turbines," e-mail dated May 18, 2009, Administrative Record No. 35, but, at the same time, (3) reveal that Dr. Mills was rightly concerned, privately, about the health issues and the inadequacies of the 21 year Maine Noise Rule to address these issues.

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EXHIBIT B TO APPEAL OF FRIENDS OF SPRUCE MOUNTAIN, ET ALS TO THE MAINE BOARD OF ENVIRONMENTAL PROTECTION

Spruce Mountain Wind Scenic Impact Evaluation

To: Dawn Hallowell, DEP
From: Friends of Spruce Mountain
Date: September 21, 2010
RE: Visual Impacts Comments for Spruce Mountain Wind (Town of Woodstock)

I: Overall Scenic Comments:

According to the 2008 report by the Governor's task force on wind energy, the following statement is included as it pertains to the visual impact of industrial wind farms:

> *Other factors to consider are the scenic character of the landscape in which the project is located, the expectations of users of the scenic resource, and how significantly the public's use and enjoyment of the resource would be adversely impacted by the presence of the project.*

The overall visual character of the area that has been identified for the Spruce Mountain Wind Project by Patriot Renewables, LLC is one of the most dominant features in the surrounding Woodstock area (visible from areas outside the town boundaries as well). Residents (both permanent and part-time) have been attracted to living and recreating in the area due to the scenic rural character of this region of the State. With this in mind, by definition, any development or structure that detracts from the scenic viewshed should be approached with a high degree of caution, planning and skepticism.

A review of the documentation that was submitted as part of the scenic evaluation of the area is not representative of the overall visual impact of the development. Indeed, a brief survey of 15 respondent hikers on Bald Mountain over Memorial Day weekend provides only a snapshot into the opinions among those who are impacted, and does not go far enough in providing the level of detail among a more diverse and representative sample of those who would be impacted by the development.

Most notably, the study (conducted by Market Decisions on behalf of Patriot Renewables, LLC) does not include a sample of area residents (both permanent and part-time) who would be impacted more consistently/continuously than those who are simply day hiking on Bald Mountain during the Memorial Day Weekend holiday. Even so, the overall visual impact of the viewshed from Bald Mountain was reduced one full point (on a 7-point scale), which in and of itself is worthy of attention, but that result was based on a comparison to the photo of the mountain (a comparison to the actual viewshed reveals that scores, on average, drop more than one-point, about a half-point increase over views of the photo array).

It is our view that this study, while representing an effort to gather information from individuals who could potentially be impacted by the development, does not go far enough, and a more comprehensive evaluation would be required to adequately assess (and have a great deal of confidence in) the impact of development on the viewshed not only from Bald Mountain, but from other locales as well (note: State statutes suggest evaluations and impact from significant National and State resources, yet these areas and locations are not only subjective, but minimize impacts among other important locations such as homes, ponds and peaks that are not identified as "significant" or "important"). Such an evaluation should consist of objective input from residents within the viewshed who would be impacted, seasonal residents, fishermen (see section on Abbott's Pond – one of Maine's Finest Lakes), hikers (both local and out-of-town), off-roaders, snowmobilers and boaters (motor, canoe, kayak) – essentially anyone who utilizes the area for recreation.

It is only through a more comprehensive study of the visual impact of this type of development that such broad-based conclusions (as suggested in the *Review of the Spruce Mountain Wind Project Visual Impact Assessment* report) can be made. By providing only a snapshot into the perspectives of a small proportion of those who utilize the area for recreation (and day-to-day living) and basing the evaluation of the overall scenic impact on the area using the information from those who have been hired by the applicant (Patriot Renewables, LLC), the visual impact of this development cannot be fully evaluated. This alone should preclude the approval of the project given the lack of due diligence by the applicant to adequately address this important issue.

II: Scenic Impacts from Abbotts Pond - Outstanding Scenic Resource:

The applicant minimizes the uniqueness of this pond, having high dramatic relief and complex relief. Listed as one of Maine's Finest Lakes, it is only 1.7 miles away from the project site. The pond, surrounded by Bald, Speckled, Black, Davis, and Mollyockett Mountains, boasts a visually diverse landscape pattern.

Seven turbines will be visible from the shoreline and the pond will be compromised by viewshed impacts. Because Abbotts Pond is listed as one of Maine's Finest Lakes and has an Outstanding Scenic Resource rating, it is deserving of the same level of analysis applied to Bald Mountain. At a minimum, user surveys should be conducted and interested parties should be allowed input on how the surveys are constructed (along with the applicant). We object to the statement by the applicant on page 20 that describes the anticipated visual impacts to Abbotts Pond as insignificant (Reference to Title 35-A § 3452 (3) (A)).

III: Scenic Impacts from Little Concord Pond - Significant Scenic Resource:

This pond is located only 1.2 miles away from the project site and three turbines will be visible. It is a principal fishery for brook trout with cold well-oxygenated water down to 30 feet and is enjoyed by visitors for its pristine character and natural views.

The applicant also minimizes the relationship of this scenic pond to other scenic viewpoints in the area. This pond is surrounded by land that has been acquired by BPL. Visitors to Little Concord Pond will also wish to use the marked trails that lead to an open lookout where all ten turbines will be visible from about 1.4 miles away. Portions of the ridge road and the clearings around the closest turbines will also be visible from the overlook. Little Concord Pond State Park is deserving of the same level of analysis that was applied to Bald Mountain. At a minimum, user surveys should be conducted and interested parties should be allowed input on how the surveys are constructed (along with the applicant). We object to the statement by the applicant on page 20 that describes the anticipated visual impacts to Little Concord Pond as insignificant (Title 35-A § 3452 (3) (A)).

IV: Scenic Impacts from Shagg Pond:

This pond is located only 0.9 miles away from the project site. There will be views of seven turbines from this pond, some as close as 1.1 miles from the northern shore. This pond provides public access and hosts many visitors.

Line of sight of wind turbines over water is a controversial issue and has not been addressed by the applicant. We strongly object to the prediction on Table 3 that the overall scenic impacts at Shagg Pond will be "Low – Medium". Placement of the turbines in close proximity and over line of sight of water will create an unreasonable adverse effect on the existing scenic character (reference Title 35-A § 3452 (3) (B)).

V: Scenic Impacts from Labrador Pond - Significant Scenic Resource:

Most of Labrador Pond will have views of all ten turbines. There are many vacation rentals on this pond and a decrease in tourism dollars will negatively affect the area. A user survey should be conducted (allowing input from interested parties) which analyzes the expectations of the typical viewer. (Reference Title 35-A § 3452 (3) (C)).

VI: Scenic Impacts from Bald Mountain Trail and Speckled Mountain Trail:

This beautiful expanse of land has incredible scenic vistas extending to Mount Washington. The area, including Little Concord Pond, has been designated a Land for Maine's Future site for its natural beauty and unique scenic qualities.

The face of Bald Mountain is the only K12 rated climb on the East Coast and attracts climbers from all over America. This area is significant in its lack of development and is situated remotely from major developments. All of the turbines will be highly visible from these trails. The significant scenic impacts will leave negative impressions on many visitors to the area.

We are questioning that the applicant provided good solid professional scenic analysis and believe they have failed to meet their burden of proof regarding significant compromise of view. We strongly object to suggestions by the applicant that views from these trails are discounted because of existing developments such as transmission lines, roads and a paper mill. Since

numerous visitors will not return to the area, we strongly object to the prediction on Table 3 that scenic impacts at these trails will be "Low – Medium" (reference Title 35-A § 3452 (3) (F)).

VII: Scenic Impacts from Concord Pond:

The findings and purpose statute 481 in the DEP standards states that:

> *The legislature finds that the economic and social well-being of the citizens of the State of Maine depends upon the location of state, municipal, educational, charitable, commercial, and industrial developments with respect to the natural environment of the State; that many developments because of their size and nature are capable of causing irreparable damage to the people and the environment on the developments sites and in their surroundings; that the location of such developments; and that discretion must be vested in state authority to regulate the location of developments which may substantially affect the environment and quality of life in Maine.*

With regard to this statute, the DEP failed to review the entire application of the Spruce Mountain project as presented by Patriot Renewables. Patriot Renewables exhibited a visual simulation of the wind tower project from Big Concord Pond. This was not reviewed based on the reporting in the draft of the approval.

According to Patriot Renewables' application, Big Concord Pond has an overall scenic rating of 2. This rating was determined by a lake study done in the State of Maine in 1989. Upon reviewing the standards that were used for evaluating the lakes, Big Concord Pond was determined to have at least one significant resource. The relief of the pond within .5 miles and 1.1 miles is over 1,000 feet. While this pond is not rated as a Great Pond in the 1989 study, the impact on Big Concord Pond with regard to distance from the Spruce Mountain Project and number of turbines visible is greater than any of the sites evaluated in the approval draft.

The approval draft references Title 38, statute 484 (3) when making findings regarding the effect of an expedited wind energy project which provides that the department shall defer to evaluation methods used for developments other than wind projects. Subsection 3 of 484 states:

> *No adverse effect on the natural environment -The developer has made adequate provision for fitting the development harmoniously into the existing natural environment and that the development will not adversely affect existing uses, scenic character, air quality, water quality or other natural resources in the municipality or in neighboring municipalities.*

Compliance with this statute has not been met with this wind project.

The Spruce Mountain Wind Project will adversely affect the quality of Big Concord Pond and its residents by *causing irreparable economic and environmental damage (statute 481)* , with **no** positive benefit. The hikers from Bald Mountain that were quoted in the approval draft stated clearly, that they would hike elsewhere due to the character change of the scene. As camp owners, that luxury is not as easily afforded.

Requests for consideration include;

- The sound should be evaluated, as Big Concord Pond sits in a "bowl" directly opposite the wind towers;
- Impact on the wildlife and proximity to the bat hibernacula, golden eagle, heron, and peregrine falcon feeding area be assessed;
- The visual effects day and night as there will be 9 strobe lights flashing off the pond all night; and
- The direct effect of shadow flicker on the pond and at the shoreline.

As constituents of the DEP, with no other source of protection in the state of Maine, the residents of the Pond were not given a fair or exhaustive evaluation in the review process based on the findings reported in the approval draft of the permit for this industrial development.

VIII: Cumulative Impacts on Future Considerations:

In considering the impact of a development that is on the scale of the Spruce Mountain Wind project by Patriot Renewables, LLC, the overall net impact should be taken into account both in the short- and long-term. Indeed, by neglecting some of the key considerations in terms of future planning, the Town of Woodstock may be negatively impacting the potential for any future developments that could have a more positive impact on the overall community.

In particular, there has been little or no consideration given to the impact on potential future tourism to the area. Studies conducted in areas where wind farms already exist, or are being planned; suggest a net negative impact on tourism (with only the magnitude of impact being considered). Notably, a survey of the visual effects of wind farms was undertaken in South Australia (*Scenic Perceptions of the Visual Effects of Wind Farms on South Australian Landscapes*, Lothian, May, 2008), with the aim of quantifying the impact of wind farms on the perceived scenic quality of landscapes. A key finding of the study was that wind farms have a net negative effect on landscapes of higher scenic quality. The study concluded that wind farms should avoid areas of higher perceived scenic quality.

A study completed in Scotland (*The Economic Impacts of Wind Farms on Scottish Tourism*, June, 2007) suggests that wind farms have a substantial impact on visitation to an area, with nearly 1-in-5 respondents to the survey (18%) suggesting that they would not visit an area if a wind farm was constructed. Additionally, nearly two-thirds (63%) stated that they prefer a landscape from a hotel bedroom (or other static location) without a wind farm. The authors suggest that visitor/tourist perceptions about wind farms are based on where they are. Thus, opinions about wind farms change if one has a passing view for a few seconds while driving compared to having a longer, static view from a residence or hotel room. Among establishments that provide accommodations with views that are impacted by wind farms, the study found a reduction in use by 5% to 16%. The study also found proposed wind farm development may lead to a 3% loss in revenue due to fewer returning tourists visiting the area (Note: It is important to keep in mind that this study was an attempt to state that the impact on tourism was minimal, yet a review of the findings suggest many worrisome findings for an area that is seeking to attract tourism, with substantial reductions in tourism dollars that would need to be off-set by increases

in the cost of electricity, as well as significant accommodations be made by the developer of the wind farms to mitigate the impacts).

The potential problem is that many people find that man-made structures such as wind turbines reduce the attractiveness of a landscape. It is thus logical to assume that reduced quality of an important feature can reduce demand to some degree, which in turn can result in either reduced prices for tourism services, reduced numbers of tourists or both. Any loss of expenditure will lead to a reduction in economic activity and result in a loss of income and jobs.

It has been suggested by both local decision-makers, as well as wind developers nationally and internationally that a wind farm can be, in and of itself a tourist attraction. While this may be true, an established wind farm can be a tourist attraction in the same way as a power station, dam or other large scale man-made structure. This of course is only true while a visit remains a novel occurrence, and does not and will not encourage repeat visitation. Conversely, tourism (Maine's largest industry) is sustainable over time, has thrived during the current recession, and encourages areas to engage in development that maintains the character of the landscape and natural resources that are a significant part of the State's heritage and appeal. Short-term economic gains (dubious at best), cannot account for the lack of future gains through more sustainable methods of attracting tourism as well as incremental economic growth and development.

In summary, because the applicant has failed to provide an adequate alternative to mitigate the impact of the project on the scenic character of Spruce Mountain, nor demonstrate that the Project will not have an unreasonable adverse effect on the scenic character and existing uses related to scenic character of this scenic resource, this project should be denied by the Maine Department of Environmental Protection.